Effectiveness of Training Program regarding Tracheostomy Care on Nurses Performance at Intensive Care Unit

[1]Rasha Nabil Malk, [2]Eman Mawed Fahem, [3]Asmaa Abouda Abdelhamed Soultan

[1&2] Medical Surgical Nursing, Faculty of Nursing, Beni-Suef University, Egypt
[3]Medical- Surgical Nursing Faculty of Nursing, Damietta University, Egypt

ABSTRACT

Background: Tracheostomy is now more common in critical care units, low performance of care can be disasters. Therefore, it is important to realize that the intensive care nurses have sufficient knowledge and skills about tracheostomy care before entering the critical care environment. **Aim of this study is** to evaluate the effect of training program on nurses' performance (knowledge and practice) regarding tracheostomy care. **Design:** A quasi-experimental design was used. **Setting**: The study was conducted in the intensive care unit at Beni-Suef University and general Hospitals. **Sample**: All convenient samples 45 nurses working in intensive care unit at Beni-Suef University and general Hospitals. **Tools:** Two tools were used a self administered questionnaire sheet to assess knowledge and observational checklist to assess practice regarding tracheostomy care. **Results**: this study showed that the majority of the nurses had unsatisfactory knowledge and practice regarding tracheostomy care pre program implementation (91.1% and 86.7% respectively) which improved significantly immediately post program (86,7% and 82,2% respectively) while this improvement lowered slightly post 3 months at follow up (73,3%and 71,1% respectively). **Conclusion:** there was significant improvement in nurse's knowledge and practices regarding tracheostomy care post the program implementation, while this improvement lowered slightly post three months at follow up, which supported the study hypothesis. **Recommendation that** Intensive care unit must have a clinical nurse educator responsible for coordinating the education, training for intensive care nursing staff.

Introduction

A tracheotomy is a surgical procedure in which an opening is made into the trachea. The indwelling tube inserted into the trachea is called a tracheostomy tube **(O' Toole, 2021).**

A tracheostomy is indicated in several situations such as the presence of an upper airway obstruction due to trauma, tumors, or swelling and the need to facilitate airway clearance due to spinal cord injury, neuromuscular disease, or severe debilitation **(Hinkle and Cheever, 2018).**

A tracheostomy tube provides the best route for long-term airway maintenance, easier secretion removal, increased patient acceptance and comfort, capability of the patient to eat and talk if possible, and easier ventilator weaning **(Urden et al., 2021).**

Tracheostomy care requirements a multidisciplinary approach, principally involving nursing care. Good tracheostomy care needs consistent suctioning, stoma care, nutrition, speech therapy, and periodic changing of the tracheostomy tube. (**Berman and Snyder, 2012**; **Pereira, Silva, Vaz, Viamonte, & Winck, 2020)**

Tracheostomy complications include airway obstruction, air leak, altered body image, aspiration, bleeding, fistula formation, impaired cough, infection— wound or respiratory tract, subcutaneous emphysema, tracheal stenosis, tracheal necrosis and tube displacement (**Harding et al., 2020**).

Without proper care, the tracheostomy tube can become obstructed from secretions leading to emergent airway distress leads to rapid-response of care, and if not cleared, death from asphyxiation. (**Masood et al, 2018).**

Tracheostomy care include: ensure the tube free of secretions, maintains a patent airway, and provides wound care. assess the patient, secure tracheostomy tubes in place. Tube movement causes irritation and coughing, which in turn may cause decannulation. Keeping the tube secure while changing the ties or holder to prevent accidental decannulation is critical. **(Ignatavicius and Workman, 2018).**

Nurses play a vital role in providing effective tracheostomy care. Performance to care for a patient with a tracheostomy requires the support and individual attention of the whole health care team. With healthcare advancement, tracheostomy care has become part of routine care in both the acute and long-term care units.

Respectable tracheostomy management has a significant impact on the patient's general well-being and quality of life. It is hence important that nurses are equipped with appropriate performance to care for patients safely and competently and to prevent possible complications. Insufficient knowledge, variation in practices, and poor suctioning technique may lead to nosocomial infections, extended hospitalization, airway complications, and even death **(Billington and Luckett, 2019)**

Significance of the study:-

The UK National Confidential Enquiry into Patient Out-comes and Death shows that there is significant morbidity and mortality in tracheostomy patients due to preventable complications. The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) reported that 24% of patients in ICU and 31% of ward patients experienced tracheostomy-related complications. **Wilkinson KA, Freeth H, Martin IC,(2015)** Annual audit con-ducted at a tertiary care hospital in Peshawar showed that early complications were 37.5% while late complications were ample 7.5%.

Tracheostomy insertion and management are progressively more common in critical care units and general wards. Therefore, nurses must be prepared with the appropriate knowledge and skills to meet the individual needs of patients with a tracheostomy safely and competently. (**Billington and Luckett, 2019)**

The reasons for failed tracheostomy included inadequacies in staff education equipment provision as well as poor monitoring and response to clinical incidents so when a clinical incident occurs relating to a tracheostomy **(Bonvento et al, 2017).**

Low performance of care can be disasters; Therefore, it is important to realize that the intensive care nurses have sufficient knowledge and skills before entering the critical care environment. Nurses working in critical care areas are responsible for observing and monitoring patient with tracheostomy tube.

Aim of the study:

The aim of the current study is to evaluate the effect of a training program on nurses' performance regarding tracheostomy care.

Research Hypothesis:
Training Program regarding Tracheostomy Care has positive effect on Nurses Performance at Intensive Care Unit

Subjects and Methods

Research Design:
A quasi-experimental design was used in this study.
The study will be portrayed under four designs:
- Technical design.
- Operational design.
- Administrative design.
- Statistical design.

Technical design:
The technical design includes setting, subjects and tools of data collection which used in this study.

A. Setting:
The study was conducted in the intensive care unit at Beni-Suef University and general Hospitals.

B. Subject:
All convenient samples included 45 nurses working in intensive care unit at Beni-Suef University and general Hospitals.

Tools of data collection:

Two tools were constructed and tested by the researcher to collect data pertinent to this study, these tools are:-

I. **A self administered questionnaire sheet: (Appendix I):**

It was used to assess nurses' level of knowledge regarding tracheostomy care. It was developed by the researcher based on review of related literature **(Marykutty, 2012; Billington and Luckett, 2019; Onuoha,2019).** It compromised Arabic structured items related to different aspects of assessment knowledge about tracheostomy care**.** It was including two parts:

❖ **Part one:**
It concerned with demographic characteristics of the nurses involved in the study (age, gender, marital status, level of education, years of experience and years of experience in intensive care unit).

❖ **Part two:**
It concerned with assessment of the following:

1- Knowledge related anatomy physiology of the trachea (5 questions) (5 grades).

2- Knowledge related to tracheostomy tube (10 questions) (10 grades).

3- Knowledge related to role of the nurse regarding tracheostomy care (24questions) (24 grades).

This tool was filled three times; the first time before the program implementation, the second time immediately after program implementation and the third time after 3 month later (follow up).

Scoring system:

All knowledge variables were closed ended questions. The total numbers were 39 questions; they were scored as the following.

• Each correct answer was given two grade
• The incorrect answer was given one grade.

Total knowledge score was classified as the following:

• ≥80% satisfactory

• <80%% unsatisfactory.

II. **Observational checklist for nurse practice regarding tracheostomy care: (Appendix II):**

It was adapted from **Lynn (2018) and Onuoha (2019) and** modified by researchers. It was used to assess nurses practices regarding tracheostomy care. It was 5 checklists used to evaluate the nurses' practice regarding suctioning the tracheostomy, assist in changing a tracheostomy tube, changing & cleaning the inner cannula, tracheostomy dressing change, and care of tracheostomy stoma site& tie. This tool was filled three times; the first times before the program implementation, the second time immediately after program implementation and the third time after 3 month later (follow up).

Scoring system:
• Complete correct done was assigned a score of (3)
• Incomplete correct done was assigned a score of (2)
• Not done was assigned a score of (1)

Total practice score was 34*3=102
Total score of practice was classified into:

• ≥80% satisfactory practice level.
• <80%% unsatisfactory practice level.

The total score was distributed as the following:
• Nurses' role regarding suction (11 grades).
• Nurses' role for tracheostomy tube with inner cannula (10 grades).
• Nurses' role for tracheostomy tie (5 grades).
• Nurses' role for tracheostomy collar (4 grades).
• Nurses' role post procedure (4 grades).

Tools validity and reliability:
• **Content validity:**
The tools were revised for content validity by a group of seven experts of Medical-Surgical Nursing Specialties. The expertise reviewed the tool for objectivity, clarity, appropriately and

comprehensiveness, minor modification was done.

- **The reliability:**

Was tested for tool one (Knowledge assessment tool), and tool two practice assessment tool) by using alpha Cronbach's test (r = 0.936, 0.900)

Operational design

The operational design included a preparatory phase, pilot study, ethical consideration and field work.

- **Pilot study:**

It was carried out on 10% of the total study. This was done to test applicability, clarity and efficiency of the tools. Modifications based on the result of pilot study were made; some statements were omitted, added or rephrased. Nurses who shared in the pilot study were excluded from the main study sample. Finally, the final forms were developed

Ethical consideration:

1. The researcher was clarifying the objective and aim of the study to the nurses included in the study.
2. The researcher was assured maintaining privacy of the subject's data for the purpose of this research only and will not be used again without new consent.
3. Nurses were informed about their rights to participate or withdraw from the study at any time without any rational. As well, the results of this study will not have any effect on their job.

Field work:

`Data were collected from the beginning September 2020 to the end of August 2021. An educational program was designed and tailored according to the needs of the nurses included 5 sessions: 30-45 minutes each, on 3 days In the opening ceremony session, the researcher introduces herself to the participants and get their expectations, then she distributes the pre-test to assess participants' baseline – knowledge. The 1st session covers an introduction and overview regarding the tracheostomy (anatomy and physiology of the trachea (definition, length, function and location). The 2nd session covers tracheostomy

tube (meaning, type, size, purposes, location, complication and precautions) 3rd, 4th, and the 5th sessions include knowledge and practices regarding role of the nurse concerning tracheostomy care The program was implemented for nurses working in the intensive care unit at Beni-Suef University and general Hospitals.

Program phase:

1. Preparatory phase:

It was included reviewing of related literature and theoretical knowledge of various aspect of the study using books, articles, internet, periodicals and magazines to develop tools for data collection and the training program for nurses.

The program implementation schedule was designed by the researcher. Goals, learning activity, teaching methods and media were prepared. The content of the educational program was divided into 5 sessions; the duration of each session is a 30: 45 minutes.

Permission for data collection and implementation of the study in Beni-Suef University and general Hospitals was obtained from the hospital administrative personnel by the submission of a formal letter from the faculty of nursing, Beni-Suef University. Meeting and discussions were held by the researcher and nurses to explain the aims, the nature and the objectives of the study and take their approval to participate in the study prior to any data collection.

Tracheostomy care educational booklet:

It was designed in Arabic language by researcher based on the results obtained from assessment of the nurses' knowledge and practice. The content was developed by the researcher after reviewing the related literature. which included anatomy and physiology of the trachea (definition, length, function and location) tracheostomy tube (meaning, type, size, purposes, location, complication and precautions) role of the nurse regarding tracheostomy care. At the end of each session, the researcher summarized the important points of this session and the participants were encouraged to ask and show their personal experience.

2. Program assessment:

The researcher was assessing of nurse's knowledge and practice about tracheostomy care at Beni-Suef University and general Hospital by used questionnaire sheet and observational checklist. The researcher was attended to the setting 3 days per week in the morning and afternoon shift.

1) As regards to the observational checklist the evaluation was done firstly to assess of nurse's practice regarding tracheostomy care.

2) As regards to the questionnaire sheet was carried to assess of nurse's knowledge regarding tracheostomy care that was filled by the nurse.

Assess of nurse's knowledge and practice was carried out three times firstly before education program, secondly immediately and thirdly after three months.

The observational checklist was filled by the researcher by observing the nurses while done the procedure. The questionnaire sheet was filled by the nurses. The time allowed for answers took about 20- 30 minutes.

Program implementation:

This was based on the studied nurses. The content of educational program sessions was organized as the following.

The theoretical part:

- Introduction of training program including objective of training program, anatomy and physiology of the trachea.
- Tracheostomy tube (meaning, type, size, location, purpose, contraindication complication, precautions, component.
- Knowledge related to role of the nurse during suction (duration, length of inserted suction tube, frequency, size of suction catheter, patient position during suction, oxygenation before suction
- Knowledge related to role of the nurse regarding stoma.
- Knowledge related to role of the nurse regarding tracheostomy tube.

The practical part:

- Role of nurse regarding tracheostomy suction.
- Nurses' role for tracheostomy tube with inner cannula.
- Nurses' role for tracheostomy tie.
- Nurses' role for tracheostomy collar.
- Nurses' role post procedure.

Teaching methods:

- Lecture
- Discussion
- Demonstration

Teaching media:

- Hand out of the program
- Data show
- Booklet
- Picture

After the official permission were taken from director of Beni-Suef university hospital and nursing director, the implementation phase started.

The program was implemented. The duration of each session is half hours, including periods of discussion according to nurses' progress and feedback. The researcher was available 3 days per week in the morning and afternoon shift in intensive care unit at Beni-Suef University and general Hospitals.

At the beginning of the first session, an orientation to the program and its aims took place. Simple words and Arabic language were used to suit the nurses' level of understanding. Each session started by revision about what was given in previous session and the objective of new topics. The booklet was distributed to all nurses in the first day of program implementation.

The Evaluation stage:

After implementation of an education program, the post test was administered to assess nurses' knowledge and practice using the same questionnaire sheet and same observational checklist of the pre- test. It was done twice, immediately after finishing training program and after three months from first evaluation, this helped to evaluate the effect of the implementing program

Administrative design:

To carry out the study, the necessary approval was obtained from the director of Beni-Suef university and general hospital. A letter was issued to him from the faculty of nursing explaining the aim of

the study in order to obtain permission for collection of data.

Statistical Design:
An IBM compatible personal computer was used to store and analyze data and to produce graphic presentation for some important results. Statistical package for the social science (SPSS) version 22 was used for statistical analysis of data, as it contains the test of significance given in standard statistical books.

▪ **Descriptive statistics**
   Data were summarized using 1) the arithmetic mean as an average, describing the central tendency of observation for each variable studied; 2) the standard deviation as a measure of dispersion of results around the mean; and 3) the frequency and percentage of observations for each variable studied. Other statistical tests such as correlation coefficient was calculated between total knowledge score and total practice score.

▪ **Level of Significance**
   For all statistical tests done, the threshold of significance was fixed at the 5% level (P-value). A p-value > 0.05 indicates non-significant result and the p-value < 0.05 indicates a significant result and the p-value is the degree of significance. The smaller the p-value obtained, the more significant is the result; the p-value being the probability of error of the conclusion.

Results

Table (1): Demonstrates that about (51.1%) of the studied nurses' their aged ranged between (25- 30) with a mean age was (26.27±3.056) years. Also, this table show that (68.9%) of the studied nurses' were females

as well (82.2%) of nurses were married. Regarding educational qualification this table shows that (51.1%) of the studied nurses' had Institute nursing education.

As regard of the nurse's year of experience of the studied nurses' (53.3%) were from 5 - 10 years of experience with a mean year of experience was (6.09±3.664) years.
Regarding the nurses' years of experience in ICU (53.3%) of the studied nurses' were having from (1-5) with a mean year of experience in ICU was (5.09±3.554) years.
Fig. (1) Illustrates that 91.1% of the studied nurses had unsatisfactory knowledge pre program implementation which improved immediately post program and follow up program (86,7% and 73,3 %) of the studied nurses had satisfactory knowledge regarding tracheostomy care respectively. **Fig. (2)** this Fig. illustrates that 86.7% of the studied nurses had unsatisfactory practice pre program implementation which improved immediately post program and follow up program (82,2% and 71,1%) of the studied nurses had satisfactory practice regarding tracheostomy care respectively.
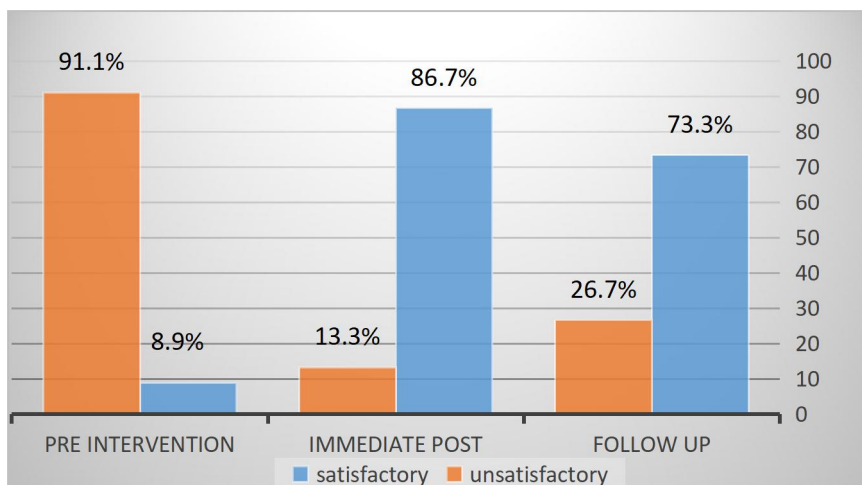**Fig. (3,4,5).** demonstrates that a highly significant positive correlation between nurses knowledge and practice at different phases of program (pre, post and follow up program) with r and p value (. 700**/ 0.000, .524/.000, .792/ .000) respectively.
Table (3): Demonstrates that a highly significant positive correlation between nurses' qualification and total practice score regarding tracheostomy care at different phases of program.

Table (4): Demonstrates that a highly significant positive correlation between nurses' qualification and total knowledge score regarding tracheostomy care at different phases of program.

Table (1): Percentage distribution of the study nurses according to their demographic characteristics

Variable	Frequency	%
Age in years		
<25	**14**	**31.1**
25-<30	**23**	**51.1**
30≥	**8**	**17.8**
Mean ±SD	**26.27±3.056**	
Gender		
Male	**14**	**31.1**
Female	**31**	**68.9**
Marital status		
Single	**8**	**17.8**
Married	37	**82.2**
Educational qualification		
Diploma nursing	**12**	**26.7**
Institute nursing education	**23**	**51.1**
Bachelor of nursing	**10**	**22.2**
Years of experience		
1-	**17**	**37.8**
5-	**24**	**53.3**
≥10	**4**	**8.9**
Mean ±SD	**6.09±3.664**	
Years of experience in ICU		
1-	**24**	**53.3**
5-	**19**	**42.2**
≥10	**2**	**4.5**
Mean ±SD	**5.09±3.554**	

Fig. (1): Percentage distribution of studied nurses' total knowledge score regarding tracheostomy care at different phases of program.
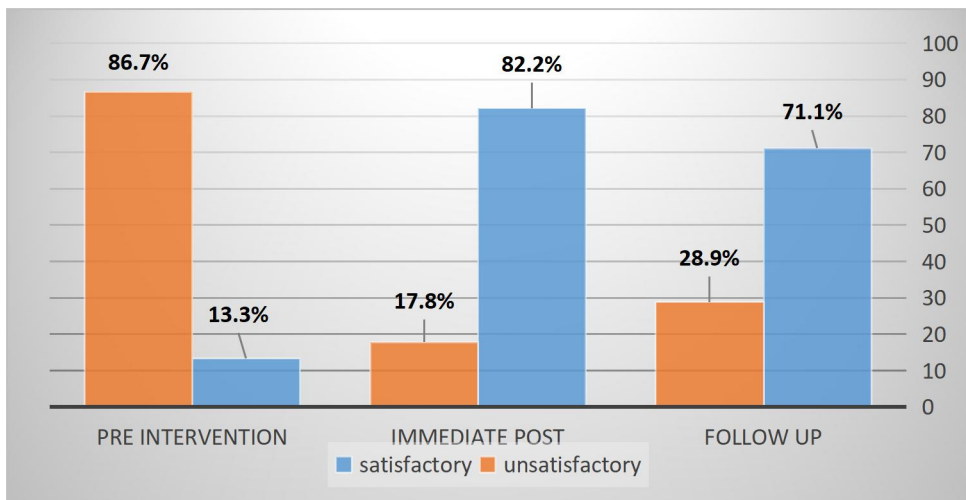
Fig. (2): Percentage distribution of studied nurses' total practice score regarding tracheostomy care at different phases of program.
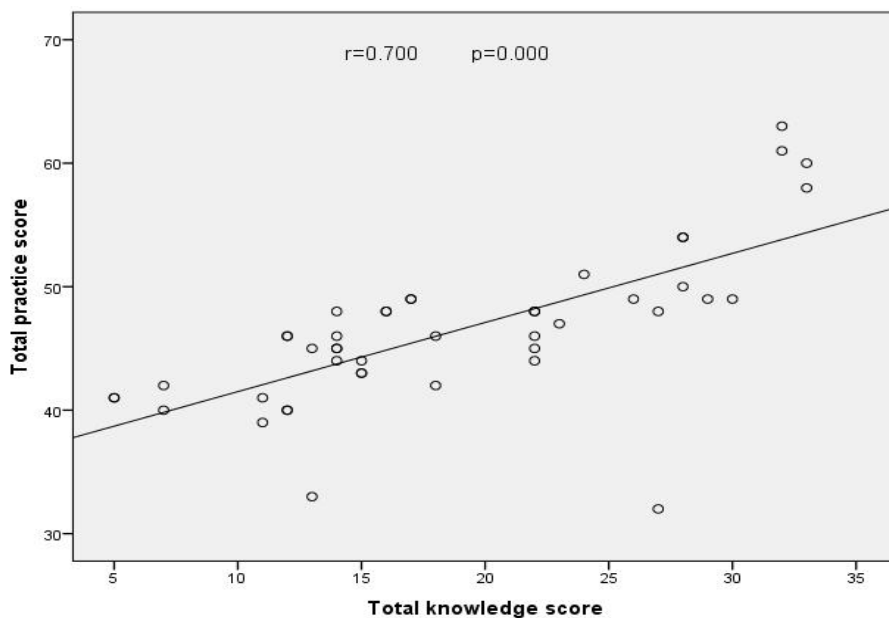

Figure (3): Correlation between total nurses' knowledge score and total of nurses' practices score before implementation of the training program.
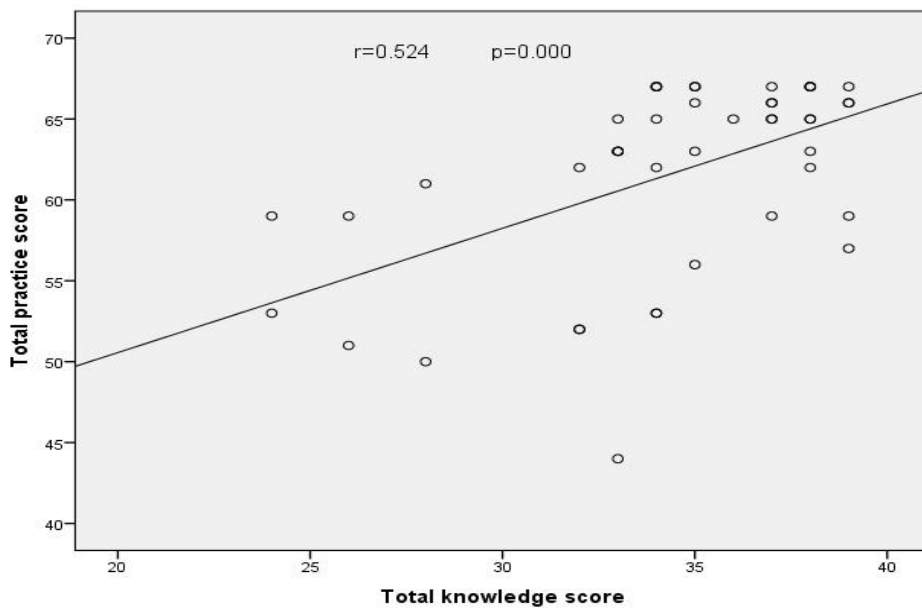
Figure (4): Correlation between total nurses' knowledge score and total of nurses' practices score post implementation of the training program.
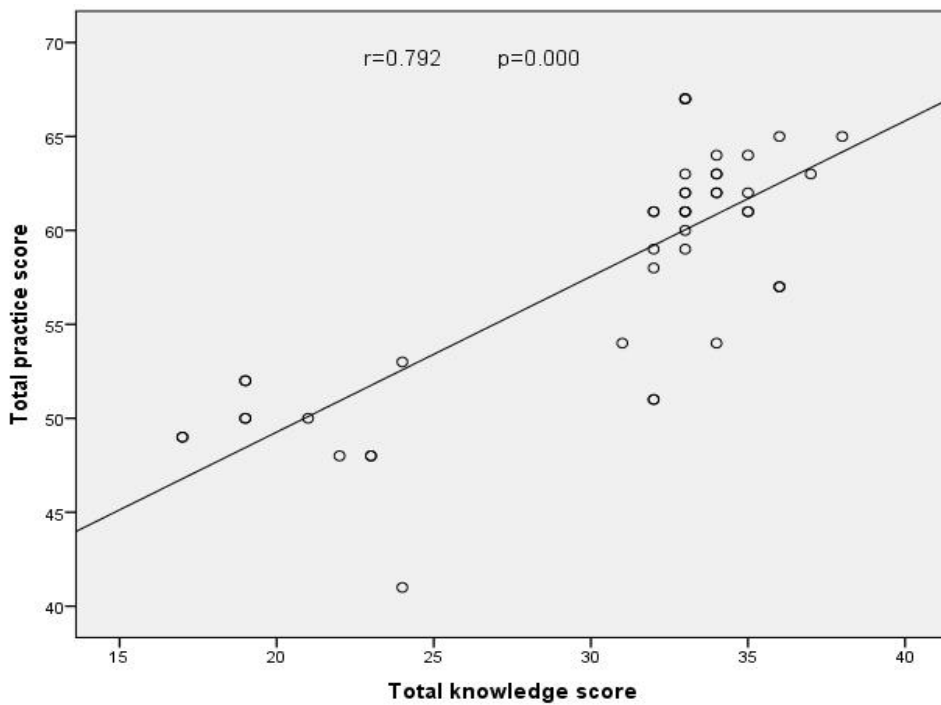

Figure (5): Correlation between total nurses' knowledge score and total of nurses' practices score follow up implementation of the training program.

Table (3): correlation between nurses' qualification and total practice score regarding tracheostomy care at different phases of program.

Nurses' qualification	Total practice		
	Pre-program	Immediate post	Follow -up
R	.488**	.350*	.432**
P	.001	.018	.003

Table (4): correlation between nurses' qualification and total knowledge score regarding tracheostomy care at different phases of program.

Nurses' qualification	Total knowledge		
	Pre-program	Immediate post	Follow -up
R	.411**	.495**	.456**
P	.005	.001	.002

Discussion

Tracheotomy is a common procedure in intensive care units, and nurses necessity deliver proper care to tracheostomy patients to prevent complications. With more patients admitted to ICUs, more tracheostomies are being done; several studies have reported an association of a tracheostomy tube with increased post-ICU mortality, which may be attributed to the inadequate experience of nursing staff who are responsible for the care of tracheostomy patients in the ICU. To care of the patient with a tracheostomy requires experienced trained nurses **(Sultan,** et al., 2019)

Firstly: Demographic characteristics of the studied nurses:

This study indicated that about half of studied nurses were at the age (25- 30 years). This might be due to a newly graduate nurses are appointed in the intensive care units. This result agreed with **Abdelazeem et al., (2019)** who stated that 56% of them was aged between 20-30 years.

As regard of the gender the study revealed that that more than two third (68.9%) of the studied nurses' were females. This might be due to the nursing education for male started lately. Supported by **Pradhan et al., (2018)** who stated that A 62% of the participants were female.

Related to nurses' educational qualification more than one third of the studied nurses' had technical nursing education, which might explain that they are young and tolerate the nature of the work in ICU. In the same line with **Qalawa et al., (2017)** who stated that half of nurses had technical nursing education. Disagreed with **Tyagi (2019).** who stated that most of the nurses had bachelor degree.

As regards to marital status, the present study indicated that most of them were married. This finding agreed with **Tadros et al., (2019).** who stated that A 62,5 % of the participants were married. Disagree with **Adhikari and Subba1 (2020).** Who stated that most of them 71.4% were unmarried.

As regard of the nurse's year of experience more than half of the studied nurses' were from 5 - 10 years of experience. This result agreed with **Anjum (2020).** who stated that more than half of the studied nurses' were from 6- 10 years of experience

Regarding the nurses' years of experience in ICU more than half of the studied nurses' were having from (1-5). This result agreed with **Mungan et al., (2019).** Were stated that 52.2% (n=79) of the nurses worked in the ICU for less than 5 years.

Secondly: Effect of training program on nurses' knowledge regarding tracheostomy care.

The study revealed that the majority of the study nurse had unsatisfactory level of knowledge regarding tracheostomy care pre-program implementation this may be due to workload, insufficient knowledge overloaded by more duties and having more work hours. Agreed with **Qadir (2018)**. the study concluded that staff nurses were having inadequate knowledge regarding tracheostomy care**.** This result disgreed with **Khanum et al (2021).** who stated that the studied nurses had good knowledge about tracheostomy care and management.

The current study revealed a significant improvement post program implementation. This is might due to positive impact of training program in improving nurses' knowledge regarding tracheostomy care. This result agreed with **Mpasa et al., (2020).** Who stated that there an improvement in knowledge was observed on the nursing care practices for the management of endotracheal tube cuff pressure for both groups following the educational intervention,

Thirdly: Effect of training program on nurses' practices regarding tracheostomy care:

The study revealed that the majority of the study nurse had unsatisfactory level of practice regarding tracheostomy care pre program implementation this may be due to poor skills, workload, lack of concentration and interruptions. Agreed with **Gaterega et al., (2021)** found only (2.5%) of the study sample with high level of practice. Also **Chen et al., (2021)** reveled that Chinese intensive care nurses lacked awareness of several essential evidence-based endotracheal suctioning practices, and there were gaps between their current practice and the guideline recommendations

The current study revealed that there was improved post program implementation. This result agreed with **Azizian et al., (2020). who stated that** a significant improvement was observed in the total mean score and other dimensions of nurses' practice in endotracheal suctioning .

Fourthly: Relation between total nurses knowledge and their practices regarding tracheostomy care

The current study revealed that were a positive correlation between total nurses' knowledge and practice at pre, post and follow up program implementation. This might due to the training program improved the nurses' knowledge and practice regarding tracheostomy care. This result agreed with **Mwakanyanga et al., (2018).** Who stated that training on ICU skills have positive influence to recommended endotracheal suctioning knowledge. On the other hand these result disagreed with **Maraş et al., (2017).** Who found that the correlation between the nurses' scores of knowledge and practice was not statistically significant.

Therefore, the effect of an educational program on nursing performance was positive for all of them and progress their knowledge and practices. These findings are reinforced by **Sabilu Y. et al. (2016)** who reported, the level of education affects the learning process, the higher the person's level of education the easier the person to receive information.

Conclusion

Based on the findings of the current study, it can be included that majority of the nurses were having an unsatisfactory performance (knowledge and practice) regarding tracheostomy care pre the program implementation. Meanwhile, the majority of the studied nurses had got statistically significant improvement in their performance post the program implementation, while this improvement lowered slightly post three months at follow up, which supported the study hypothesis.

Recommendations

Based on results of the present study the following recommendations can be suggested:

1. Intensive care unit must have a Clinical Nurse Educator responsible for coordinating the education, training for intensive care nursing staff.

2. All staff nurse appointed to intensive care must be prepared to revise. update and

develop their knowledge and practice regarding tracheostomy care.

3. Established booklet guideline for intensive care nurses regarding tracheostomy care.

Further researcher

Implementing the educational training program on larger sample selected from different geographical areas of Egypt is necessary to raise the efficiency of nurses regarding tracheostomy care.

References

Abdelazeem, E., Fashafsheh, I., & Fadllalah, H. (2019): Effect of Training Program on Nurses Knowledge and Competence Regarding Endotracheal Tube and Tracheostomy Care in Mechanically Ventilated Patients, International Journal of Nursing, June 2019, Vol. 6, No. 1, pp. 48-57.

Adhikari, K. M. and Subba1, H. K. (2020): Practice regarding care of endotracheal tube among nurses working in teaching hospital. Bhagalpur. Journal of Chitwan Medical College 2020;10

Anjum, N. (2020): "A Study to Assess the Effectiveness of Self Instructional Module on Knowledge and Demonstration on Skill Regarding Care of Chest Tube Drainage among Staff Nurses at Skims Hospital Soura Srinagar Kashmir" IOSR Journal of Nursing and Health Science. Volume 9, Issue 3. PP 16-43

Azizian, K., Azadi , A., Yousef Veisani , Y. and Bastami, M. (2020): The effect of performance feedback and educational video on endotracheal-suctioning practices of critical care nurses. Journal of Education and Health Promotion. May 28;9:112.

Berman, A., and Snyder, S., (2012): Fundamentals of NURSING Concepts, Process and practice, 9th ed., Company of JohnWiley & Sons, Inc., New York, pp. 1604-16010.

Billington, J., and Luckett, A.(2019): Care of the critically ill patient with a tracheostomy. Jan 25;34(2):59-65.

Bonvento, B., Wallace, S., Lynch, J., Coe, B., & McGrath, B. A. (2017): Role of the multidisciplinary team in the care of the tracheostomy patient. Journal of Multidisciplinary Healthcare, 10, 391–398.

Chen , W., Hu , S., Liu , X., Wang, N., Zhao, J., Liu, P., Chen, K. and Hu. J. (2021): Intensive care nurses' knowledge and practice of evidence-based recommendations for endotracheal suctioning: a multisite cross-sectional study in Changsha, China 2021 doi: 10.1186/s12912-021-00715-y.

Gaterega, T., Mwiseneza. M. and Chironda, G. (2021): Nurses knowledge and practices regarding tracheostomy care at a selected referral hospital in Rwanda – A descriptive cross-sectional study. International Journal of Africa Nursing Sciences. August 2021.

Harding, M., Kwong, J., Roberts, D., Hagler, D. and Reinisch, C. (2020): Lewis's Medical surgical nursing: assessment and management of clinical problems. 11th ed. Elsevier Inc. pp, 488. Canda

Hinkle, J. L. and Cheever, K. H. (2018): Brunner and Suddarth's textbook of medical surgical nursing.14th ed. Wolters Kluwer Health/ Lippincott Williams and Wilkins. P. 1480.china

Ignatavicius, D.D., Workman, M. L Rebar, C. R., & Heimgartner, N. M.(2020): Medical- surgical nursing concept of interprofessional collaborative care. 9th ed. Saunders, an imprint of Elsevier Inc. pp. 576.

Khanum, T., Zia, S., Khan, T. K., Kamal, S., Khoso, N., Alvi, J., & Ali, A. (2021): Assessment of knowledge regarding tracheostomy care and management of early complications among healthcare professionals. Brazilian Journal of Otorhinolaryngology, August 2021.https://doi.org/10.1016/j.bjorl.2021.06.011.

Lynn, P. (2018): Taylor's clinical nursing skills: a nursing process approach. Lippincott Williams & Wilkins.4th ed. 307-312.

Maraş, G., Güler, E. K., Eşer, I. and Köse, S. (2017): Knowledge and practice of intensive care nurses for endotracheal suctioning in a teaching hospital in western Turkey. Intensive and critical care nursing, volume 39, April 2017, p 45

Marykutty, K. V. (2012): A study to evaluate the effectiveness of planned teaching programme regarding tracheostomy care in terms of knowledge of staff nurses working in government hospital Tumkur (Doctoral dissertation).

Masood, M. M., Farquhar, D. R., Biancaniello, C., and Hackman, T. G. (2018): Association of Standardized Tracheostomy Care Protocol Implementation and Reinforcement With the Prevention of Life-Threatening Respiratory Events. JAMA Otolaryngol Head Neck Surg. 2018;144(6):527-532. doi:10.1001/jamaoto.2018.0484 (33):16-19

Mpasa, F., Dalena R, Rooyen , M, . Venter, D , Jordan , P and Wilma Ten Ham-Baloyi , w. T.(2020): Improving nurses' knowledge of managing endotracheal tube cuff pressure in intensive care units: A quasi-experimental study. 2020 Dec 18;25:1479

Mungan, ˙Ibrahim, Kazancı, Dilek, Bektas¸, S¸erife, Sarı, Sema, Çavus¸, Mine, & Turan, Sema (2019): The evaluation of nurses' knowledge related to tracheostomy care in tertiary intensive care units. International Medicine, 1(6), 313. https://doi.org/10.5455/ im.10.5455/im.54258.

Mwakanyanga , E. T., Masika , G. M. and Tarimo, E. A. (2018): Intensive care nurses' knowledge and practice on endotracheal suctioning of the intubated patient: Aquantitative cross-sectional observational study 2018 Aug 16;13(8):e0201743.

O, Toole, M. T., (2021): Mosby's Dictionary of Medicine, Nursing, Health professions.11th ed. Elsevier. p 1805. Canda. of JohnWiley & Sons, Inc., New York, pp. 1604-16010.

Onuoha, J. (2019): Developing an Educational Program for Tracheostomy Care, Walden Dissertations and Doctoral Studies, Walden University, Scholar Works.

Pereira, F., Silva, A. M., Vaz, I. M., Viamonte, S., & Winck, J. C. (2020): Tracheostomy prevalence at skilled Nursing facilities, Pulmonology, 26(2), 90-94. https://doi.org/10.1016/j.pulmoe. 2019. 05.011

Pradhan, A., Neupane, N., Sah, S. K., Kuwar, S., & Shah, S. (2018): Knowledge Regarding Tracheostomy Care among Nursing Students. Int. J. Adv. Microbiol. Health. Res, 2(2), 23–29.

Qadir, M. B. (2018). A study to assess the impact of structured teaching programme on knowledge regarding tracheostomy care among staff nurses working in selected hospital of Kashmir. International Journal of Nursing Research (IJNR), 4(1), 29–35.

Qalawa, S. A., Diab, A. E., El-Gazzar, S. E. and El-Gawab, H. M, (2017): Quality of nursing care on patients with tracheostomy Vol(4), No(1) June 2017 port said scientific journal of nursing

Sabilu Y., Kusnan A., Saptaputra S., Jafriati (2016): The Sexually Transmitted Infection (STI) In Women Sexual Workers (WSW) in Southeast Sulawesi Province. IOSR Journal of Nursing and Health Science, 2016, 5(6) Ver. I: 119-122.

Sultan, S., A., Abdullah, H., A., Meteb, A., A., Muneer, O., A., Ahmed, M., B., (2019): Nursing Students' Clinical Practice Soura Srinagar Kashmir" IOSR Journal of Nursing and Health Science. Volume 9, Issue 3. PP 16-43

Tadros, S. A., Abd EL Sattar, M., Shehata, H. and Nader, M.: (2019): Effect of Self Learning Package on Nurses' Performance Caring for Patients on Ventilators, Egyptian Journal of Health Care, 2019 EJHC Vol.10 No.3, pp. 48-57 ISSN 2373-7662

Tyagi, H. (2019): Effectiveness of Video Assisted Teaching Module Regarding Tracheostomy Care on Knowledge Among Staff Nurses at Selected Hospital of Gwalior City. Global Nursing Journal of India.

Urden L.D, Stacy K.M, Lough M.E. (2021): Critical care nursing: Diagnosis and management. 9th ed. St. Louis: Elsevier.

Wilkinson KA, Freeth H, Martin IC,(2015): Are we ''on the righttrach?'' The National Confidential Enquiry into Patient Out-come and Death examines tracheostomy care. J Laryngol Otol.2015;129:212---6.5